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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the inhalation-of-air flow rate control unit for diesel power plants which has the prevention function of an engine shutdown at the time of no motor energizing.

[0002]

[Description of the Prior Art] The inhalation-of-air flow rate control unit for diesel power plants is constituted by the throttle valve prepared in the inhalation-of-air path as indicated by JP,6-307295,A, and the stepper motor which drives this, and when a stepper motor controls whenever [valve-opening / of a throttle valve], inspired air volume and the pressure within inhalation of air are controlled. Although the output of a diesel power plant is determined by the amount of supply of a fuel and inspired air volume does not participate in an output greatly, if inspired air volume will be in the condition of being less than the specified quantity, continuation operating will become impossible, an engine stops, and transit becomes impossible. For this reason, the spring for valve opening energized in the valve-opening direction is prepared in a throttle valve so that it may be possible to make a throttle valve full open, to carry out continuation operation and to evacuate, when a motor is disconnected or a control drive circuit breaks down, and the ability of the spring for valve opening is set up so that valve-opening torque required for driving a throttle valve and a motor in the full open direction may be acquired. Moreover, the cogging torque of a motor etc. is eased and, as for this spring, the effectiveness made to rotate smoothly also has the throttle valve.

[0003] Drawing 5 and drawing 6 are the operating-characteristic Figs. of such a conventional inhalation-of-air flow rate control unit for diesel power plants. Although drawing 5 shows the flow rate of the inhalation of air to whenever [valve-opening / of a throttle valve] and the flow rate of inhalation of air increases in proportion to whenever [valve-opening], the leakage flow Q of the throttle valve at the time of a close by-pass bulb completely will be less than flow Q (ID) required at the time of an engine idling, for this reason drives it to a valve full open-side as mentioned above at the time of failure, and the configuration which performs the inhalation of air exceeding inspired air volume required for idling operation is taken. Drawing 6 shows an ability setup of the spring for valve opening which drives a throttle valve to a full open side. When the torque of a motor disappears working [an engine], in order for the torque A of the direction of clausilium accompanying the flow of inhalation of air to join a throttle valve and to drive this in the full open direction Bigger valve-opening torque than the curve shown with the broken line (MD+F+A) of drawing 6 which is the total value of this torque A, the detent torque MD of a motor, a motor, and friction torque F of a throttle valve is needed. Ability is set up so that the torque beyond the value which showed the spring for valve opening to the continuous line (valve-opening torque with a spring) of drawing 6 may be acquired.

[0004]

[Problem(s) to be Solved by the Invention] As mentioned above, it sets to the conventional inhalation-of-air flow rate control unit for diesel power plants. Although operation disabling in the time of failure

etc. was avoided by making larger than the total value of the torque of the direction of clausilium accompanying the flow of inhalation of air, the detent torque of a motor, and friction torque, such as a valve stem, valve-opening torque of the spring which drives a valve to a full open side Enlarging valve-opening torque of a spring needs the torque exceeding the total value of torque and friction torque with a spring at the time of the drive of the valve by the motor. Inevitably, it enlarged and weight increased, the moment of inertia of Rota became large, responsibility got worse, and the motor had evils, such as causing a cost rise, further.

[0005] Moreover, JP,10-89094,A is indicated as a remedy to these troubles. The straight line which this technique made ability of a spring small and was shown as the continuous line (valve-opening torque with a spring) in drawing 6 To the curve by the total value of the torque and the detent torque of a motor by the inhalation-of-air style shown with the broken line ($MD+F+A$), and friction torque, such as a valve stem, by making it cross by the close-by-pass-bulb-completely side of whenever [valve-opening] from curved maximum When energization is lost on a motor, a throttle valve is held in the state of half-opening with a spring. According to this technique, valve-opening torque of a spring can be made to some extent small, the need torque of a motor may be reduced, but against the clausilium torque by the inhalation-of-air style, for holding a throttle valve in a predetermined valve-opening location, valve-opening torque of a spring could not be made extremely small, but it was inadequate for control of lightweight-izing by the miniaturization of a motor, and moment of inertia.

[0006] This invention aims at obtaining the inhalation-of-air flow rate control unit for diesel power plants which can miniaturize the motor for throttle-valve actuation by having been made in order to solve such a technical problem, supplying inspired air volume required for idling operation of an engine, without opening a throttle valve at the time of no energizing [of a motor], and making small torque of the spring energized to a valve-opening side.

[0007]

[Means for Solving the Problem] The inhalation-of-air flow rate control unit for diesel power plants concerning this invention is equipped with the valve stem prepared in the inhalation-of-air path free [rotation], the throttle valve which is attached in this valve stem and controls the circulation air content of an inhalation-of-air path, the stepper motor which is combined with a valve stem and drives a throttle valve from an open position to a closed position, and the spring which energizes a throttle valve in the full-open direction, and it sets them up so that the leakage flow rate of the inhalation of air in the closed position of a throttle valve may become larger than inspired air volume required at the time of idling operation of an engine.

[0008] Moreover, the leakage flow rate of inhalation of air is set up by the variation of tolerance of the inside diameter of an inhalation-of-air path, and the outer-diameter dimension of a throttle valve. Furthermore, the leakage flow rate of inhalation of air is set up by notching prepared in the throttle valve, or the through tube. The leakage flow rate of inhalation of air is set up further again by regulating the throttle valve position in a close-by-pass-bulb-completely condition.

[0009] moreover, the time of setting to F_{max} maximum of the torque according the maximum of S_{min} and the detent torque at the time of no motor energizing to friction of MD_{max} and a valve stem in the minimum value of the valve-opening torque of the spring which energizes a throttle valve in the full open direction -- formula $S_{min} < --$ The ability of a spring is set up so that $MD_{max}+F_{max}$ may be satisfied.

[0010]

[Embodiment of the Invention] Gestalt 1. drawing 1 of operation is an explanatory view in which the outline block diagram, drawing 2, and drawing 3 of the inhalation-of-air flow rate control unit for diesel power plants of implementation of this invention show an operating characteristic. [of a gestalt 1] In drawing, the throttle valve by which 1 is prepared in the inhalation-of-air path 2, and 3 are the valve stems in which this throttle valve 1 was attached with the screw 4, bearing of the rotation of both ends is made free by the bearing 6 by which the valve stem 3 was formed in the body 5, one edge is combined with Rota 8 of the stepper motor 7 attached in the body 5, and the sensor 9 which detects the opening of a throttle valve 1 according to the rotation angle of a valve stem 3 is formed in the other-end section. It

is the STOP lever which 10 is prepared between the guide 11 fixed to the body 5 side, and the guide 12 fixed to the valve-stem 3 side, and the spring which energizes a valve stem 3 to a valve-opening side, and 13 are fixed to a valve stem 3, and regulates the operating range of a valve stem 3.

[0011] Thus, in the inhalation-of-air flow rate control unit for diesel power plants of the gestalt 1 of implementation of this constituted invention, a stepper motor 7 receives a signal from the control drive circuit which is not illustrated, a valve stem 3 is driven, inspired air volume is adjusted, and a control drive circuit controls whenever [throttle valve-opening] to the specified quantity based on an engine condition, detecting the opening location of a throttle valve 1 with the position signal from a sensor 9. To change of the angular position from the open position of a throttle valve 1 to a closed position, inspired air volume is set up as shown in drawing 2, and it is set up so that the leakage flow Q of the inhalation of air especially at the time of a close by-pass bulb completely may become larger than inspired-air-volume Q (ID) required at the time of an engine idling. The leakage flow Q of this inhalation of air is attained by setting the difference of the inside diameter of the inhalation-of-air path 2, and the outer-diameter dimension of a throttle valve 1 as the dimension which $Q > Q$ (ID) satisfies, and prepares notching or a through tube in a part of throttle valve 1, and is attained by setting such area as a predetermined value.

[0012] Since continuation operation of an engine of a throttle valve is attained also in the state of a close by-pass bulb completely by setting up ullage Q of inhalation of air in this way, the cogging torque of the motor 7 at the time of it becoming unnecessary for a spring 10 to open a throttle valve 1, and making a spring 10 rotate a throttle valve 1 etc. will be mitigated, and there should be only ability rotated smoothly. in this case, the time of setting [the minimum value of valve-opening torque with a spring] maximum of MD_{max} and friction torque F of a throttle valve to F_{max} for the maximum of the detent torque MD of S_{min} and a motor, as the ability of a spring 10 is shown in the property Fig. of drawing 3 - formula $S_{min} < --$ What is necessary is just to set it as the value with which are satisfied of $MD_{max} + F_{max}$. Therefore, a spring 10 can reduce the ability equivalent to the torque of the direction of clausilium which joins a throttle valve 1 in connection with the flow of inhalation of air compared with the above-mentioned conventional example, the miniaturization of the part motor of it will be attained, and it can perform improvement in the responsibility by control of lightweight-izing and moment of inertia, can be cheap and can obtain the good inhalation-of-air flow rate control unit for diesel power plants of responsibility.

[0013] Gestalt 2. drawing 4 of operation is the fragmentary sectional view of the inhalation-of-air flow rate control unit for diesel power plants of the gestalt 2 of implementation of this invention, and it is made for the gestalt of this operation to satisfy above-mentioned $Q > Q$ (ID) by regulating the closed position of a throttle valve 1. In drawing, 13 is fixed to a valve stem 3, it is the STOP lever which regulates the operating range of a valve stem 3, and contact side 13a is prepared in STOP lever 13. When 14 is attached in the body 5, it is the stopper which has contact side 14a and contact side 13a of STOP lever 13 and contact side 14a of a stopper 14 contact, a valve stem 3 is constituted so that rotation may be prevented in a predetermined location, the location where a valve stem 3 has rotation prevented is set as the location where a throttle valve 1 has fixed opening, and this is set up as a closed position.

[0014] Thus, by constituting, a throttle valve 1 can set up the ability of a spring 10 small like the gestalt 1 of operation by holding predetermined opening in a closed position and setting it as the location with which above-mentioned $Q > Q$ (ID) is satisfied of the opening, and improvement in the responsibility by the formation of small lightweight of a motor and control of moment of inertia is attained. Moreover, by **** etc. constituting a stopper 14 and enabling adjustment of the location of contact side 14a, the halt location of a valve stem 3 can be changed, the leakage flow Q of the inhalation of air in the closed position of a throttle valve 1 can be adjusted, and use can be made possible also to the engine with which inspired-air-volume Q (ID) required at the time of an idling differs.

[0015]

[Effect of the Invention] As explained above, according to the inhalation-of-air flow rate control unit for diesel power plants of this invention Since the leakage flow rate of the inhalation of air at the time of the close by-pass bulb completely of a throttle valve is set up more greatly than the need inspired air volume

at the time of an engine idling and the throttle valve enabled it to continue operation of an engine also in the state of a close by-pass bulb completely Even when driving force is lost according to energization impossible accident etc., the motor which drives a throttle valve Ability of the spring for opening a throttle valve like equipment before is not needed. The motor which drives a throttle valve can be miniaturized, and moment of inertia of Rota can be made small, lightweight-izing is possible and the good inhalation-of-air flow rate control unit for diesel power plants of a response system can be obtained.

[Translation done.]